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NATIONAL EUTROPHICATION SURVEY
WORKING PAPER SERIES**



REPORT
ON
JOES VALLEY RESERVOIR
EMERY COUNTY
UTAH
EPA REGION VIII
WORKING PAPER No. 841

**CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON
and
ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA**

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REPORT
ON
JOES VALLEY RESERVOIR
EMERY COUNTY
UTAH
EPA REGION VIII
WORKING PAPER No. 841

WITH THE COOPERATION OF THE
UTAH STATE DIVISION OF HEALTH
AND THE
UTAH NATIONAL GUARD
OCTOBER, 1977

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16. ABSTRACT Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.		
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LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§105 and §305(d)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

- a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.
- b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.
- c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGEMENT

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Utah Department of Social Services, and the Utah Department of Natural Resources for professional involvement, to the Utah National Guard for conducting the tributary sampling phase of the Survey, and to those Utah wastewater treatment plant operators who voluntarily provided effluent samples and flow data.

The staffs of the Bureau of Water Quality of the Division of Health and the Division of Wildlife Resources provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

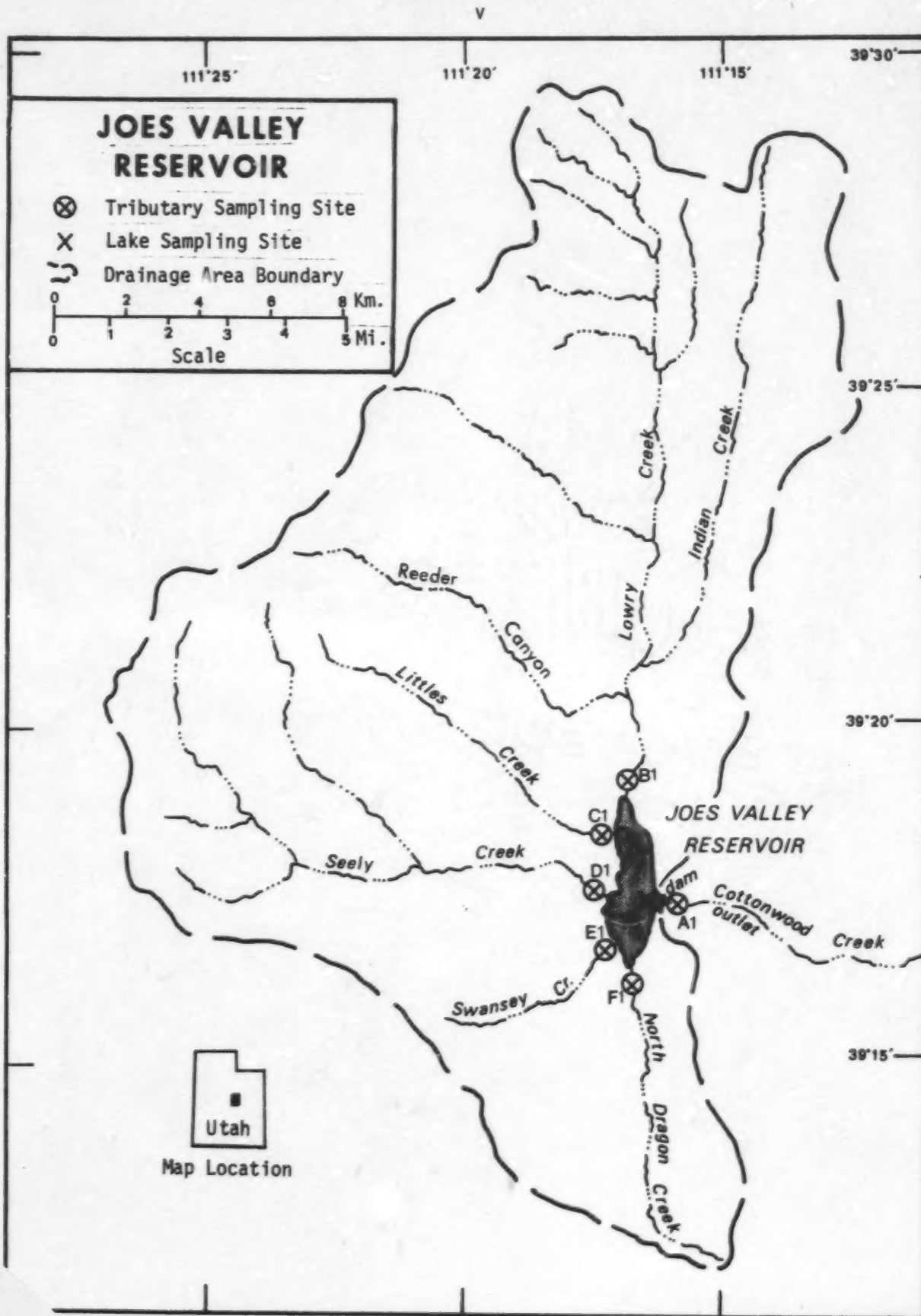
Major General Maurice L. Watts, the Adjutant General of Utah, and Project Officer Lt. Colonel T. Ray Kingston, who directed the volunteer efforts of the Utah National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES AND RESERVOIRS

STATE OF UTAH

NAME	COUNTY
Bear	Rich, UT; Bear Lake, ID
Deer Creek	Wasatch
Echo	Summit
Fish	Sevier
Flaming Gorge	Daggett, UT;
	Sweetwater, WY
Huntington	Emery
Joel Valley	Emery
Lower Bowns	Garfield
Lynn	Box Elder
Minersville	Beaver
Moon	Duchesne
Navajo	Kane
Newcastle	Iron
Otter Creek	Piute
Panguich	Garfield
Pelican	Uintah
Pineview	Weber
Piute	Piute
Porcupine	Cache
Powell	Garfield, Kane, San
	Juan, UT; Coconino, AZ
Pruess	Millard
Sevier Bridge	Juab, Sanpete
Starvation	Duchesne
Steinaker	Uintah
Tropic	Garfield
Utah	Utah
Willard Bay	Box Elder



JOES VALLEY RESERVOIR

STORET NO. 4908

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Joes Valley Reservoir is mesotrophic. It ranked sixth in overall trophic quality when the 27 Utah lakes and reservoirs sampled in 1975 were compared using a combination of six parameters*. Five of the water bodies had less median total phosphorus, one had less and three had the same median dissolved orthophosphorus, 11 had less median inorganic nitrogen, four had less mean chlorophyll a, and ten had greater mean Secchi disc transparency. Depression of dissolved oxygen with depth occurred at sampling station 1 in September (3.8 mg/l at 36.6 meters).

Survey limnologists noted some surface concentrations of algae in August.

B. Rate-Limiting Nutrient:

The algal assay results indicate the reservoir was phosphorus limited in September. The reservoir data indicate nitrogen limitation in May and phosphorus limitation in August and September.

C. Nutrient Controllability:

1. Point sources--No known point sources impacted Joes Valley Reservoir during the sampling year.
2. Non-point sources--Non-point sources contributed the entire

* See Appendix A.

phosphorus loading to the reservoir during the sampling year. Lowry Creek contributed 45.9% of the total, Seely Creek contributed 29.6%, and Littles Creek added 13.2%. The ungaged minor tributaries and immediate drainage contributed an estimated 3.4%.

The estimated phosphorus loading of $0.70 \text{ g/m}^2/\text{year}$ is less than that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading but is more than his suggested oligotrophic loading (i.e., a mesotrophic loading; see page 11). Therefore, management of the reservoir should be directed toward prevention of any increase in the loading.

II. RESERVOIR AND DRAINAGE BASIN CHARACTERISTICS[†]

A. Morphometry^{††}:

1. Surface area: 4.74 kilometers².
2. Mean depth: 16.3 meters.
3. Maximum depth: 37.5 meters.
4. Volume: $77.093 \times 10^6 \text{ m}^3$.
5. Mean hydraulic retention time: 316 days.

B. Tributary and Outlet: (See Appendix C for flow data)

1. Tributaries -

<u>Name</u>	<u>Drainage area (km²)*</u>	<u>Mean flow (m³/sec)*</u>
Lowry Creek	186.5	1.470
Little Creek	16.6	0.113
Seely Creek	93.2	1.200
Swansey Creek	16.3	0.023
North Dragon Creek	38.8	0.002
Minor tributaries & immediate drainage -	<u>22.0</u>	<u>0.030</u>
Totals	373.4	2.838

2. Outlet -

Cottonwood Creek	378.1**	2.820
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C. Precipitation***:

1. Year of sampling: 24.7 centimeters.
2. Mean annual: 26.2 centimeters.

[†] Table of metric conversions--Appendix B.

^{††} Sudweeks, 1975.

* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".

** Includes area of reservoir.

*** See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Joes Valley Reservoir was sampled three times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at two stations on the reservoir (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the last visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 36.9 meters at station 1 and 12.5 meters at station 2.

The sampling results are presented in full in Appendix D and are summarized in the following table.

0.030	55.0	Immediate drainage -
0.030	378.4	Totals
0.050	378.1**	Cottonwood Creek

C. Precipitation**:
1. Year of sampling: 84.7 centimeters.
2. Mean annual: 86.5 centimeters.
+ Table of metric conversions--Appendix B.
+ Subwaters, 1975.
* For limits of accuracy, see Working Paper No. 175, "Survey Methods, 1973-1978".
** Includes area of reservoir.
*** See Working Paper No. 175.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR JOE'S VALLEY RESERVOIR
STORET CODE 4988

PARAMETER	1ST SAMPLING (5/13/75)				2ND SAMPLING (8/12/75)				3RD SAMPLING (9/24/75)			
	RANGE	MEAN	MEDIAN	2 SITES	RANGE	MEAN	MEDIAN	2 SITES	RANGE	MEAN	MEDIAN	2 SITES
TEMP (C)	4.8 - 25.4	11.9	10.3		7.6 - 19.0	14.8	17.7		11.6 - 17.0	15.3	16.6	
DISS OXY (MG/L)	9.2 - 9.6	9.3	9.4		6.0 - 8.2	7.4	7.8		3.8 - 8.2	6.5	7.2	
CNOCITY (MCROMO)	241. - 270.	256.	257.		272. - 347.	320.	338.		239. - 295.	269.	274.	
PH (STAND UNITS)	8.4 - 8.5	8.5	8.5		8.0 - 8.5	8.3	8.3		8.2 - 8.6	8.4	8.5	
TOT ALK (MG/L)	201. - 202.	201.	201.		179. - 195.	184.	191.		190. - 202.	195.	194.	
TOT P (MG/L)	0.011 - 0.015	0.013	0.012		0.010 - 0.037	0.016	0.013		0.007 - 0.010	0.010	0.009	
ORTHO P (MG/L)	0.003 - 0.014	0.011	0.011		0.002 - 0.005	0.003	0.003		0.002 - 0.007	0.003	0.003	
NO2+NO3 (MG/L)	0.020 - 0.040	0.023	0.020		0.020 - 0.240	0.111	0.120		0.020 - 0.240	0.116	0.100	
AMMONIA (MG/L)	0.020 - 0.030	0.021	0.020		0.020 - 0.050	0.026	0.020		0.020 - 0.020	0.020	0.020	
KJEL N (MG/L)	0.200 - 0.300	0.220	0.200		0.200 - 0.500	0.373	0.400		0.400 - 1.200	0.709	0.600	
INORG N (MG/L)	0.040 - 0.060	0.044	0.040		0.040 - 0.260	0.137	0.170		0.040 - 0.260	0.136	0.120	
TOTAL N (MG/L)	0.220 - 0.320	0.243	0.220		0.320 - 0.720	0.484	0.420		0.600 - 1.220	0.825	0.840	
CHLRPYL A (UG/L)	2.0 - 2.1	2.0	2.0		3.2 - 4.4	3.8	3.8		1.6 - 1.6	1.6	1.6	
SECCHI (METERS)	1.8 - 1.8	1.8	1.8		2.4 - 2.4	2.4	2.4		3.0 - 3.7	3.4	3.4	

B. Biological Characteristics:

1. Phytoplankton

Sampling Date	Dominant Genera	Algal Units per ml
05/13/75	1. <u>Flagellates</u> 2. <u>Microcystis sp.</u> 3. <u>Chroomonas (?) sp.</u> 4. <u>Carteria sp.</u> 5. <u>Cryptomonas sp.</u>	1,354 1,113 242 48 48
	Total	2,805
08/12/75	1. <u>Cyclotella sp.</u> 2. <u>Dinobryon sp.</u> 3. <u>Chroomonas (?) sp.</u> 4. <u>Microcystis sp.</u> 5. <u>Cryptomonas sp.</u> Other genera	1,976 476 256 110 73 74
	Total	2,965
09/24/75	1. <u>Microcystis sp.</u> 2. <u>Fragilaria sp.</u> 3. <u>Dinobryon sp.</u> 4. <u>Cryptomonas sp.</u> Other genera	610 326 163 41 39
	Total	1,179

2. Chlorophyll a

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/13/75	1	2.1
	2	2.0
08/12/75	1	4.4
	2	3.2
09/24/75	1	1.6
	2	1.6

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

<u>Spike (mg/l)</u>	<u>Ortho P Conc. (mg/l)</u>	<u>Inorganic N Conc. (mg/l)</u>	<u>Maximum yield (mg/l-dry wt.)</u>
Control	0.005	0.140	0.2
0.050 P	0.055	0.140	5.3
0.050 P + 1.0 N	0.055	1.140	16.2
1.0 N	0.005	1.140	0.1

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of the reservoir was moderately low at the time the sample was collected (09/24/75). Also, the increased yield resulting from the addition of phosphorus alone indicates that the reservoir was phosphorus limited at that time. Note that the addition of nitrogen alone did not result in an increased yield.

The reservoir data indicate nitrogen limitation in May and phosphorus limitation in August and September (the mean inorganic nitrogen/orthophosphorus ratios were 4/1, 46/1, and 45/1, respectively).

- A. Waste sources
1. Known municipal - None
 2. Known industrial - None

IV. NUTRIENT LOADINGS (See Appendix E for data)

For the determination of nutrient loadings, the Utah National Guard collected monthly near-surface grab samples when possible from each of the tributary sites indicated on the map (page v), except for the high runoff month of May when two samples were collected at three of the sites. Sampling was begun in November, 1974, and was completed in September, 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Utah District Office of the U.S. Geological Survey for the tributary sites nearest the reservoir.

In this report, nutrient loads for sampled tributaries were calculated using mean annual concentrations and mean annual flows. Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the mean concentrations in Little Creek at station C-1 and the mean annual ZZ flow.

No known wastewater treatment plants impacted the reservoir during the sampling year.

A. Waste Sources:

1. Known municipal - None
2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs - Annual Total Nitrogen Loading - Average Year:

<u>Source</u>	<u>kg P/ yr</u>	<u>% of total</u>
a. Tributaries (non-point load) -		
Lowry Creek	1,530	45.9
Little Creek	440	13.2
Seely Creek	985	29.6
Swansey Creek	165	4.9
North Dragon Creek	15	0.5
b. Minor tributaries & immediate drainage (non-point load) -	115	3.4
c. Known municipal STP's - None	-	-
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Direct precipitation*	85	2.5
Total	3,335	100.0

2. Outputs -

Reservoir outlet - Cottonwood Creek

2,310

3. Net annual P accumulation - 1,025 kg.

<u>kg P/km²/yr</u>	<u>kg P/km²/yr</u>	<u>Tributary</u>
161	8	Lowry Creek
188	27	Little Creek
460	17	Seely Creek
	10	Swansey Creek
	1	North Dragon Creek

* See Working Paper No. 175.

* See Working Paper No. 175.

8. Annual Total Phosphorus Loading - Average Year:

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Lowry Creek	30,085	36.2
Littles Creek	3,125	3.8
Seely Creek	42,840	51.6
Swansey Creek	885	1.1
North Dragon Creek	115	0.1
b. Minor tributaries & immediate drainage (non-point load) -	830	1.0
c. Known municipal STP's - None	-	-
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Direct precipitation*	5,115	6.2
Total	82,995	100.0

2. Outputs -

Reservoir outlet - Cottonwood
Creek 87,240

3. Net annual N loss - 4,245 kg.

D. Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km ² /yr	kg N/km ² /yr
Lowry Creek	8	161
Littles Creek	27	188
Seely Creek	11	460
Swansey Creek	10	54
North Dragon Creek	<1	3

* See Working Paper No. 175.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m ² /yr	0.70	0.22	17.5	loss*

Vollenweider phosphorus loadings
(g/m²/yr) based on mean depth and mean
hydraulic retention time of Joes Valley Reservoir:

"Dangerous" (eutrophic loading)	0.84
"Permissible" (oligotrophic loading)	0.42

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the reservoir, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, unsampled point sources discharging directly to the reservoir, or insufficient outlet sampling. Whatever the cause, a similar nitrogen loss has occurred at Shagawa Lake, Minnesota, which has been intensively studied by EPA's former National Eutrophication and Lake Restoration Branch (Malueg et al., 1975).

V. LITERATURE REVIEWED

Yearly Losses

Malueg, Kenneth W., D. Phillips Larsen, Donald W. Schults, and Howard T. Mercier; 1975. A six-year water, phosphorus, and nitrogen budget for Shagawa Lake, Minnesota. Jour. Environ. Qual., vol. 4, no. 2, pp. 236-242.

Sudweeks, Calvin K., 1975. Personal communication (reservoir morphometry). UT Bur. of Env. Health, Salt Lake City.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

or becoming oligotrophic if morphometry permitted. A meso-

photic loading would be considered one between "dangerous"

and "permissible".

Note that Vollenweider's model may not be applicable to

water bodies with short hydraulic retention times.

grams/m ² /yr	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
0.70	0.22	17.5	loss*	

Vollenweider phosphorus loadings
(g/m²/yr) based on mean depth and mean
hydraulic retention time of Jones Valley Reservoir:

0.64	"Dangerous" (eutrophic loading)
0.42	"Permissible" (oligotrophic loading)

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the reservoir, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, unanalyzed point sources discharging directly to the reservoir, or insufficient outlet sampling. Whatever the cause, a smaller nitrogen loss has occurred at Shagawa Lake, Minnesota, which has been intensively studied by EPA's former National Eutrophication and Lake Restoration Branch (Malueg et al., 1975).

VI. APPENDICES

[illegible]

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEAN TOTAL P	MEAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEAN DISS ORTHO P
0408	LAKE POWELL	0.010	0.410	339.830	3.081	13.800	0.007
4901	SEAR LAKE	0.011	0.040	253.167	0.945	9.200	0.003
4902	LOWER BOWN'S RESERVOIR	0.031	0.040	336.080	5.567	9.400	0.006
4903	DEER CREEK RESERVOIR	0.038	0.215	430.333	9.078	14.800	0.006
4904	ECHO RESERVOIR	0.047	0.170	450.333	6.967	14.000	0.012
4905	LYNN RESERVOIR	0.121	0.200	417.667	39.600	10.400	0.052
4906	FISH LAKE	0.023	0.040	152.000	12.483	10.400	0.004
4907	HUNTINGTON NORTH RESERVOIR	0.013	0.040	392.000	1.900	7.800	0.005
4908	JOE'S VALLEY RESERVOIR	0.012	0.045	400.000	2.483	11.200	0.003
4909	MINERSVILLE RESERVOIR	0.192	0.060	445.000	33.583	8.600	0.107
4910	MOON LAKE	0.008	0.040	381.000	2.700	9.600	0.002
4911	NAVAJO LAKE	0.016	0.040	368.000	2.000	6.000	0.003
4912	NEWCASTLE RESERVOIR	0.051	0.040	428.667	12.467	13.600	0.009
4913	OTTER CREEK RESERVOIR	0.067	0.040	453.667	11.767	10.600	0.033
4914	PANQUITCH LAKE	0.071	0.040	426.500	45.950	14.200	0.010
4915	PELICAN LAKE	0.044	0.050	438.500	6.350	8.400	0.004
4916	PINEVIEW RESERVOIR	0.028	0.300	435.083	5.692	14.600	0.006
4917	PIUTE RESERVOIR	0.047	0.150	482.625	25.329	11.600	0.007
4918	PORCUPINE RESERVOIR	0.025	0.110	440.000	7.860	12.400	0.011
4919	PRUESS RESERVOIR (GARRIS)	0.057	0.140	491.000	4.533	8.800	0.008
4920	SEVIER BRIDGE RESERVOIR	0.026	0.355	449.778	18.222	12.400	0.008
4921	STARVATION RESERVOIR	0.016	0.040	394.583	5.675	13.200	0.004
4922	STEINAKER RESERVOIR	0.011	0.040	316.750	1.844	12.600	0.005
4923	TROPIC RESERVOIR	0.021	0.050	425.000	7.200	8.400	0.006
4924	UTAH LAKE	0.132	0.320	490.583	72.012	11.400	0.012
4925	WILLARD BAY RESERVOIR	0.044	0.060	457.182	7.567	11.000	0.009
5605	FLAMING GORGE RESERVOIR	0.011	0.690	285.636	2.500	10.400	0.003

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
0408	LAKE POWELL	96 (25)	100 (1)	81 (21)	73 (19)	15 (4)	42 (11)	311
4501	BEAR LAKE	90 (23)	100 (1)	96 (25)	100 (26)	77 (20)	90 (23)	540
4902	LOWER BOWN'S RESERVOIR	46 (12)	100 (1)	85 (22)	65 (17)	73 (19)	50 (13)	406
4903	DEER CREEK RESERVOIR	42 (11)	100 (1)	42 (11)	35 (9)	0 (0)	58 (14)	196
4904	ECHO RESERVOIR	31 (8)	100 (1)	19 (5)	50 (13)	12 (3)	13 (3)	152
4905	LYNN RESERVOIR	8 (2)	100 (1)	58 (15)	8 (2)	62 (15)	4 (1)	163
4906	FISH LAKE	62 (16)	100 (1)	100 (26)	23 (6)	62 (15)	79 (20)	391
4907	HUNTINGTON NORTH RESERVOIR	77 (20)	100 (1)	69 (18)	92 (24)	96 (25)	69 (18)	468
4508	JOE'S VALLEY RESERVOIR	81 (21)	100 (1)	62 (16)	85 (22)	46 (12)	96 (25)	428
4909	MINERSVILLE RESERVOIR	0 (0)	100 (1)	27 (7)	12 (3)	85 (22)	0 (0)	168
4910	MOON LAKE	100 (26)	100 (1)	73 (19)	77 (20)	69 (18)	100 (26)	506
4911	NAVAJO LAKE	69 (18)	100 (1)	77 (20)	88 (23)	100 (26)	85 (22)	506
4912	NEWCASTLE RESERVOIR	23 (6)	100 (1)	46 (12)	27 (7)	19 (5)	27 (7)	229
4913	OTTER CREEK RESERVOIR	15 (4)	100 (1)	15 (4)	31 (8)	54 (14)	8 (2)	210
4914	PANQUITCH LAKE	12 (3)	100 (1)	50 (13)	4 (1)	0 (2)	23 (6)	162
4915	PELICAN LAKE	37 (9)	100 (1)	35 (9)	54 (14)	90 (23)	73 (19)	343
4916	PINEVIEW RESERVOIR	50 (13)	100 (1)	38 (10)	58 (15)	4 (1)	58 (14)	223
4917	PIUTE RESERVOIR	27 (7)	100 (1)	8 (2)	15 (4)	38 (10)	46 (12)	165
4918	PORCUPINE RESERVOIR	58 (15)	100 (1)	31 (8)	38 (10)	33 (8)	19 (5)	217
4919	PRUSS RESERVOIR	19 (5)	100 (1)	0 (0)	69 (18)	81 (21)	37 (9)	241
4920	SEVIER BRIDGE RESERVOIR	54 (14)	100 (1)	23 (6)	19 (5)	33 (8)	37 (9)	174
4921	STARVATION RESERVOIR	73 (19)	100 (1)	65 (17)	62 (16)	23 (6)	79 (20)	389
4922	STEINAKER RESERVOIR	85 (22)	100 (1)	88 (23)	96 (25)	27 (7)	65 (17)	448
4923	TROPIC RESERVOIR	65 (17)	100 (1)	54 (14)	46 (12)	90 (23)	58 (14)	363
4924	UTAH LAKE	4 (1)	100 (1)	4 (1)	0 (0)	42 (11)	13 (3)	75
4925	WILLARD BAY RESERVOIR	37 (9)	100 (1)	12 (3)	42 (11)	50 (13)	31 (8)	216
5605	FLAMING GORGE RESERVOIR	90 (23)	100 (1)	92 (24)	81 (21)	62 (15)	90 (23)	415

16

2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956	1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901	1900	1899	1898	1897	1896	1895	1894	1893	1892	1891	1890	1889	1888	1887	1886	1885	1884	1883	1882	1881	1880	1879	1878	1877	1876	1875	1874	1873	1872	1871	1870	1869	1868	1867	1866	1865	1864	1863	1862	1861	1860	1859	1858	1857	1856	1855	1854	1853	1852	1851	1850	1849	1848	1847	1846	1845	1844	1843	1842	1841	1840	1839	1838	1837	1836	1835	1834	1833	1832	1831	1830	1829	1828	1827	1826	1825	1824	1823	1822	1821	1820	1819	1818	1817	1816	1815	1814	1813	1812	1811	1810	1809	1808	1807	1806	1805	1804	1803	1802	1801	1800	1799	1798	1797	1796	1795	1794	1793	1792	1791	1790	1789	1788	1787	1786	1785	1784	1783	1782	1781	1780	1779	1778	1777	1776	1775	1774	1773	1772	1771	1770	1769	1768	1767	1766	1765	1764	1763	1762	1761	1760	1759	1758	1757	1756	1755	1754	1753	1752	1751	1750	1749	1748	1747	1746	1745	1744	1743	1742	1741	1740	1739	1738	1737	1736	1735	1734	1733	1732	1731	1730	1729	1728	1727	1726	1725	1724	1723	1722	1721	1720	1719	1718	1717	1716	1715	1714	1713	1712	1711	1710	1709	1708	1707	1706	1705	1704	1703	1702	1701	1700	1699	1698	1697	1696	1695	1694	1693	1692	1691	1690	1689	1688	1687	1686	1685	1684	1683	1682	1681	1680	1679	1678	1677	1676	1675	1674	1673	1672	1671	1670	1669	1668	1667	1666	1665	1664	1663	1662	1661	1660	1659	1658	1657	1656	1655	1654	1653	1652	1651	1650	1649	1648	1647	1646	1645	1644	1643	1642	1641	1640	1639	1638	1637	1636	1635	1634	1633	1632	1631	1630	1629	1628	1627	1626	1625	1624	1623	1622	1621	1620	1619	1618	1617	1616	1615	1614	1613	1612	1611	1610	1609	1608	1607	1606	1605	1604	1603	1602	1601	1600	1599	1598	1597	1596	1595	1594	1593	1592	1591	1590	1589	1588	1587	1586	1585	1584	1583	1582	1581	1580	1579	1578	1577	1576	1575	1574	1573	1572	1571	1570	1569	1568	1567	1566	1565	1564	1563	1562	1561	1560	1559	1558	1557	1556	1555	1554	1553	1552	1551	1550	1549	1548	1547	1546	1545	1544	1543	1542	1541	1540	1539	1538	1537	1536	1535	1534	1533	1532	1531	1530	1529	1528	1527	1526	1525	1524	1523	1522	1521	1520	1519	1518	1517	1516	1515	1514	1513	1512	1511	1510	1509	1508	1507	1506	1505	1504	1503	1502	1501	1500	1499	1498	1497	1496	1495	1494	1493	1492	1491	1490	1489	1488	1487	1486	1485	1484	1483	1482	1481	1480	1479	1478	1477	1476	1475	1474	1473	1472	1471	1470	1469	1468	1467	1466	1465	1464	1463	1462	1461	1460	1459	1458	1457	1456	1455	1454	1453	1452	1451	1450	1449	1448	1447	1446	1445	1444	1443	1442	1441	1440	1439	1438	1437	1436	1435	1434	1433	1432	1431	1430	1429	1428	1427	1426	1425	1424	1423	1422	1421	1420	1419	1418	1417	1416	1415	1414	1413	1412	1411	1410	1409	1408	1407	1406	1405	1404	1403	1402	1401	1400	1399	1398	1397	1396	1395	1394	1393	1392	1391	1390	1389	1388	1387	1386	1385	1384	1383	1382	1381	1380	1379	1378	1377	1376	1375	1374	1373	1372	1371	1370	1369	1368	1367	1366	1365	1364	1363	1362	1361	1360	1359	1358	1357	1356	1355	1354	1353	1352	1351	1350	1349	1348	1347	1346	1345	1344	1343	1342	1341	1340	1339	1338	1337	1336	1335	1334	1333	1332	1331	1330	1329	1328	1327	1326	1325	1324	1323	1322	1321	1320	1319	1318	1317	1316	1315	1314	1313	1312	1311	1310	1309	1308	1307	1306	1305	1304	1303	1302	1301	1300	1299	1298	1297	1296	1295	1294	1293	1292	1291	1290	1289	1288	1287	1286	1285	1284	1283	1282	1281	1280	1279	1278	1277	1276	1275	1274	1273	1272	1271	1270	1269	1268	1267	1266	1265	1264	1263	1262	1261	1260	1259	1258	1257	1256	1255	1254	1253	1252	1251	1250	1249	1248	1247	1246	1245	1244	1243	1242	1241	1240	1239	1238	1237	1236	1235	1234	1233	1232	1231	1230	1229	1228	1227	1226	1225	1224	1223	1222	1221	1220	1219	1218	1217	1216	1215	1214	1213	1212	1211	1210	1209	1208	1207	1206	1205	1204	1203	1202	1201	1200	1199	1198	1197	1196	1195	1194	1193	1192	1191	1190	1189	1188	1187	1186	1185	1184	1183	1182	1181	1180	1179	1178	1177	1176	1175	1174	1173	1172	1171	1170	1169	1168	1167	1166	1165	1164	1163	1162	1161	1160	1159	1158	1157	1156	1155	1154	1153	1152	1151	1150	1149	1148	1147	1146	1145	1144	1143	1142	1141	1140	1139	1138	1137	1136	1135	1134	1133	1132	1131	1130	1129	1128	1127	1126	1125	1124	1123	1122	1121	1120	1119	1118	1117	1116	1115	1114	1113	1112	1111	1110	1109	1108	1107	1106	1105	1104	1103	1102	1101	1100	1099	1098	1097	1096	1095	1094	1093	1092	1091	1090	1089	1088	1087	1086	1085	1084	1083	1082	1081	1080	1079	1078	1077	1076	1075	1074	1073	1072	1071	1070	1069	1068	1067	1066	1065	1064	1063	1062	1061	1060	1059	1058	1057	1056	1055	1054	1053	1052	1051	1050	1049	1048	1047	1046	1045	1044	1043	1042	1041	1040	1039	1038	1037	1036	1035	1034	1033	1032	1031	1030	1029	1028	1027	1026	1025	1024	1023	1022	1021	1020	1019	1018	1017	1016	1015	1014	1013	1012	1011	1010	1009	1008	1007	1006	1005	1004	1003	1002	1001	1000	999	998	997	996	995	994	993	992	991	990	989	988	987	986	985	984	983	982	981	980	979	978	977	976	975	974	973	972	971	970	969	968	967	966	965	964	963	962	961	960	959	958	957	956	955	954	953	952	951	950	949	948	947	946	945	944	943	942	941	940	939	938	937	936	935	934	933	932	931	930	929	928	927	926	925	924	923	922	921	920	919	918	917	916	915	914	913	912	911	910	909	908	907	906	905	904	903	902	901	900	899	898	897	896	895	894	893	892	891	890	889	888	887	886	885	884	883	882	881	880	879	878	877	876	875	874	873	872	871	870	869	868	867	866	865	864	863	862	861	860	859	858	857	856	855	854	853	852	851	850	849	848	847	846	845	844	843	842	841	840	839	838	837	836	835	834	833	832	831	830	829	828	827	826	825	824	823	822	821	820	819	818	817	816	815	814	813	812	811	810	809	808	807	806	805	804	803	802	801	800	799	798	797	796	795	794	793	792	791	790	789	788	787	786	785	784	783	782	781	780	779	778	777	776	775	774	773	772	771	770	769	768	767	766	765	764	763	762	761	760	759	758	757	756	755	754	753	752	751	750	749	748	747	746	745	744	743	742	741	740	739	738	737	736	735	734	733	732	731	730	729	728	727	726	725	724	723	722	721	720	719	718	717	716	715	714	713	712	711	710	709	708	707	706	705	704	703	702	701	700	699	698	697	696	695	694	693	692	691	690	689	688	687	686	685	684	683	682	681	680	679	678	677	676	675	674	673	672	671	670	669	668	667	666	665	664	663	662	661	660	659	658	657	656	655	654	653	652	651	650	649	648	647	646	645	644	643	642	641	640	639	638	637	636	635	634	633	632	631	630	629	628	627	626	625	624	623	622	621	620	619	618	617	616	615	614	613	612	611	610	609	608	607	606	605	604	603	602	601	600	599	598	597	596	595	594	593	592	591	590	589
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CONVERSION FACTORS

Hectares x 2.47 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107 x 10⁻⁶ = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.234 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 2.591 = lbs/square mile

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

CONVERSION FACTORS

APPENDIX C

TRIBUTARY FLOW DATA

[illegible]

10/18/76

TRIBUTARY FLOW INFORMATION FOR UTAH

LAKE CODE 4908 JOE'S VALLEY RES.

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 378.1

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
4908A1	378.1	0.42	0.42	0.42	1.05	4.53	8.50	5.66	5.66	3.40	2.80	0.42	0.42	2.82
4908B1	186.5	0.20	0.23	0.31	1.02	4.81	6.51	2.12	0.96	0.57	0.40	0.28	0.23	1.47
4908C1	16.6	0.014	0.017	0.023	0.085	0.368	0.481	0.170	0.085	0.042	0.028	0.023	0.017	0.113
4908D1	93.2	0.14	0.20	0.23	0.79	3.96	5.38	1.70	0.76	0.45	0.31	0.23	0.17	1.20
4908E1	16.3	0.0	0.0	0.066	0.017	0.085	0.113	0.028	0.014	0.008	0.006	0.0	0.0	0.023
4908F1	38.8	0.0	0.0	0.0	0.003	0.008	0.011	0.003	0.003	0.0	0.0	0.0	0.0	0.002
4908Z2	25.9	0.0	0.0	0.068	0.023	0.113	0.142	0.028	0.020	0.011	0.008	0.0	0.0	0.030

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 378.1
SUM OF SUB-DRAINAGE AREAS = 377.4

TOTAL FLOW IN = 33.98
TOTAL FLOW OUT = 33.73

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW
4908A1	11	74	0.340	9	0.263		
	12	74	0.368	18	0.340		
	1	75	0.283	12	0.263		
	2	75	0.283	8	0.263		
	3	75	0.283	8	0.283		
	4	75	0.283	5	0.283		
	5	75	4.248	3	1.501	17	5.663
	6	75	9.061	8	4.814		
	7	75	12.743	1	21.804		
	8	75	4.814	16	5.097		
	9	75	3.115	27	2.832		
	10	75	2.775				
	11	74	0.255	9	0.311		
	12	74	0.227	16	0.227		
	1	75	0.198	11	0.198		
	2	75	0.170	8	0.198		
	3	75	0.227	8	0.198		
	4	75	0.368	5	0.227	17	3.681
	5	75	3.115	3	0.368		
	6	75	9.628	8	14.158		
	7	75	7.362	1	14.442		
	8	75	0.708	16	0.708		
	9	75	0.651	27	0.481		
	10	75	0.368				

10/18/76

TRIBUTARY FLOW INFORMATION FOR UTAH

LAKE CODE 4908 JOE'S VALLEY RES.

MEAN MONTHLY FLOWS AND DAILY FLOWS (CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW
4908C1	11	74	0.008	9	0.017		
	12	74	0.0	16	0.0		
	1	75	0.0	11	0.0		
	2	75	0.0	8	0.0		
	3	75	0.0	8	0.0		
	4	75	0.011	5	0.0		
	5	75	0.198	3	0.028	17	0.198
	6	75	0.906	8	1.359		
	7	75	0.538	1	0.793		
	8	75	0.057	16	0.057		
4908D1	9	75	0.014	27	0.011		
	10	75	0.008				
	11	74	0.538	9	0.680		
	12	74	0.255	18	0.283		
	1	75	0.227	11	0.255		
	2	75	0.255	8	0.283		
	3	75	0.368	8	0.311		
	4	75	0.595	5	0.510		
	5	75	2.832	3	0.793	17	4.248
	6	75	0.495	8	10.760		
4908E1	7	75	3.398	1	6.230		
	8	75	0.934	16	0.878		
	9	75	0.340	27	0.255		
	10	75	0.198				
	11	74	0.0	9	0.0		
	12	74	0.0	16	0.0		
	1	75	0.0	11	0.0		
	2	75	0.0	8	0.0		
	3	75	0.0	8	0.0		
	4	75	0.003	5	0.003		
4908F1	5	75	0.057	3	0.006	17	0.071
	6	75	0.255	8	0.368		
	7	75	0.042	1	0.071		
	8	75	0.008	16	0.008		
	9	75	0.0	27	0.0		
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
4908G1	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
4908H1	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
4908I1	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
4908J1	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
4908K1	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
4908L1	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
4908M1	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
4908N1	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
4908O1	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
4908P1	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
4908Q1	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
4908R1	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
4908S1	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
4908T1	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
4908U1	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
4908V1	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
4908W1	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
4908X1	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
	1	75	0.0				
	2	75	0.0				
4908Y1	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				
	11	74	0.0				
	12	74	0.0				
4908Z1	1	75	0.0				
	2	75	0.0				
	3	75	0.0				
	4	75	0.0				
	5	75	0.0				
	6	75	0.0				
	7	75	0.0				
	8	75	0.0				
	9	75	0.0				
	10	75	0.0				

10/18/76

TRIBUTARY FLOW INFORMATION FOR UTAH

LAKE CODE 4908 JOE'S VALLEY RES.

MEAN MONTHLY FLOWS AND DAILY FLOWS (CMS)

TRIBUTARY MONTH YEAR MEAN FLOW DAY FLOW DAY FLOW DAY FLOW

4908ZZ 11 74 0.0 0.0 0.0 0.0 0.0

4908ZZ 12 74 0.0 0.0 0.0 0.0 0.0

4908ZZ 1 75 0.0 0.0 0.0 0.0 0.0

4908ZZ 2 75 0.0 0.0 0.0 0.0 0.0

4908ZZ 3 75 0.0 0.0 0.0 0.0 0.0

4908ZZ 4 75 0.003 0.003 0.003 0.003 0.003

4908ZZ 5 75 0.005 0.005 0.005 0.005 0.005

4908ZZ 6 75 0.340 0.340 0.340 0.340 0.340

4908ZZ 7 75 0.057 0.057 0.057 0.057 0.057

4908ZZ 8 75 0.011 0.011 0.011 0.011 0.011

4908ZZ 9 75 0.0 0.0 0.0 0.0 0.0

4908ZZ 10 75 0.0 0.0 0.0 0.0 0.0

4908ZZ 11 75 0.0 0.0 0.0 0.0 0.0

4908ZZ 12 75 0.0 0.0 0.0 0.0 0.0

4908ZZ 1 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 2 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 3 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 4 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 5 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 6 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 7 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 8 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 9 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 10 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 11 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 12 76 0.0 0.0 0.0 0.0 0.0

4908ZZ 1 77 0.0 0.0 0.0 0.0 0.0

4908ZZ 2 77 0.0 0.0 0.0 0.0 0.0

MEAN MONTHLY FLOWS AND DAILY FLOWS (CMS)

LAKE CODE 4908 JOE'S VALLEY RES.

TRIBUTARY FLOW INFORMATION FOR UTAH

10/18/76

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/08/12

FEED FROM INDICATED
KAYAK 2000 TO BE

490801
39 17 20.0 111 10 15.0 3
JOE'S VALLEY RESERVOIR
49015 UTAH

110691

11EPALES 2111202
0098 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	WATER TEMP CENT	00300 MG/L	00077 TRANSP SECCHI INCHES	00094 CONDUCTIVITY FIELD MICRONHO	00400 PH SU	00410 TALK CAC03 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2+NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/13	14 20 0000	14 20 0000	0.7.1	9.2	72	259	8.50	202	0.030	0.300	0.020	0.014
75/05/13	14 20 0005	14 20 0005	0.7.1	9.4		259	8.50	201	0.020	0.200	0.020	0.011
75/05/13	14 20 0015	14 20 0015	0.7.1	9.4		251	8.40	201	0.020	0.200	0.020	0.003
75/05/13	14 20 0040	14 20 0040	0.7.1	9.2		248	8.40	201	0.020	0.200	0.020	0.011
75/05/13	14 20 0065	14 20 0065	0.7.1	9.2		241	8.40	201	0.020	0.200	0.020	0.011
75/05/13	14 20 0094	14 20 0094	0.7.1	9.2		244	8.40	202	0.020	0.200	0.040	0.012
75/08/12	12 00 0000	12 00 0000	18.4	8.0	96	344	8.05	179	0.020K	0.400	0.020K	0.003
75/08/12	12 00 0005	12 00 0005	18.1	7.8		338	8.45	181	0.020K	0.300	0.020K	0.002K
75/08/12	12 00 0015	12 00 0015	17.7	7.2		333	8.50	179	0.020K	0.400	0.020K	0.002
75/08/12	12 00 0030	12 00 0030	10.6	6.6		288	8.20	183	0.030	0.400	0.160	0.003
75/08/12	12 00 0060	12 00 0060	8.0	6.0		272	8.20	188	0.030	0.400	0.230	0.003
75/08/12	12 00 0121	12 00 0121	7.6	6.0		283	8.20	190	0.020K	0.400	0.240	0.003
75/08/12	10 15 0000	10 15 0000	16.6	7.8	144	295	8.60	190	0.020K	1.000	0.020K	0.003
75/08/12	10 15 0005	10 15 0005	16.6	7.2		273	8.60	191	0.020K	1.200	0.020K	0.003
75/08/12	10 15 0024	10 15 0024	16.6	7.2		269	8.50	193	0.020K	0.600	0.030	0.004
75/08/12	10 15 0037	10 15 0037	16.4	7.0		253	8.20	197	0.020K	0.500	0.160	0.002
75/08/12	10 15 0050	10 15 0050	13.2	4.4		239	8.20	198	0.020K	0.400	0.230	0.007
75/08/12	10 15 0085	10 15 0085	11.7	4.0		250	8.20	202	0.020K	0.600	0.240	0.004
75/08/12	10 15 0120	10 15 0120	11.6	3.8		250	8.25	202	0.020K	0.600	0.240	0.003
75/05/13	14 20 0000	14 20 0000	0.014	2.1		261	8.30	193	0.020	0.200	0.180	0.005
75/05/13	14 20 0005	14 20 0005	0.012			278	8.20	180	0.050K	0.200	0.150	0.003
75/05/13	14 20 0015	14 20 0015	0.012			276	8.20	130	0.050K	0.200	0.050K	0.003
75/05/13	14 20 0040	14 20 0040	0.012			240	8.30	191	0.050K	0.200	0.050K	0.002
75/05/13	14 20 0065	14 20 0065	0.011			520	8.22	501	0.050K	0.200	0.050K	0.002
75/05/13	14 20 0094	14 20 0094	0.013			520	8.22	505	0.050K	0.200	0.050K	0.002
75/08/12	12 00 0000	12 00 0000	0.013			510	8.20	503	0.050K	0.200	0.050K	0.002
75/08/12	12 00 0005	12 00 0005	0.015			510	8.20	501	0.050K	0.200	0.050K	0.002
75/08/12	12 00 0015	12 00 0015	0.011									
75/08/12	12 00 0030	12 00 0030	0.012									
75/08/12	12 00 0060	12 00 0060	0.025									
75/08/12	12 00 0121	12 00 0121	0.037									
75/09/24	10 15 0000	10 15 0000	0.009									
75/09/24	10 15 0005	10 15 0005	0.010									
75/09/24	10 15 0024	10 15 0024	0.009									
75/09/24	10 15 0037	10 15 0037	0.009									
75/09/24	10 15 0050	10 15 0050	0.010									
75/09/24	10 15 0085	10 15 0085	0.015									
75/09/24	10 15 0120	10 15 0120	0.01A									

110691

0025 1001 00414 07422 00
110691
49015 UTAH
JOE'S VALLEY RESERVOIR
39 17 20.0 111 10 15.0 3
490801

26

APPENDIX E
TRIBUTARY AND WASTEWATER
TREATMENT PLANT DATA

STORE RETRIEVAL DATE 76/08/12

4908A1
39 17 10.0 111 16 10.0 4
COTTONWOOD CREEK
49 7.5 JOES VLY RES
O/JOES VALLEY RESERVOIR 110691
BANK .1 MI DOWNSTREAM FROM JOES VALLEY DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630		TOT KJEL N	00610		00671		00665	
			N-TOTAL	MG/L		NH3-N TOTAL	MG/L	PHOS-DIS ORTHO	MG/L P	PHOS-TOT	MG/L P
74/11/09	13 30		0.032		0.200	0.025		0.010		0.010	
75/02/08	12 15		0.250		0.600	0.032		0.008K		0.010K	
75/03/08	12 40		0.071		0.875	0.056		0.005K		0.015	
75/04/05	11 00		0.085		0.100	0.025		0.005K		0.030	
75/05/03	13 15		0.070		0.800	0.060		0.005K		0.020	
75/05/17	12 45		0.025		2.100	0.020		0.005K		0.090	
75/06/08	10 30		0.560		1.880	0.037		0.010		0.010	
75/07/01	16 50		0.150		0.150	0.005K		0.010		0.030	
75/08/16	11 00		0.310		0.350	0.020		0.005K		0.020	
75/09/27	11 30		0.1000		0.200	0.005K		0.005			

K VALUE KNOWN TO BE
LESS THAN INDICATED

12/08/51	10 02		0.020		0.300	0.002		0.002K		0.010K	
12/08/19	10 00		0.000		0.300	0.000		0.002K		0.010	
12/01/01	11 10		0.012		0.200	0.002K		0.010		0.000	
12/08/09	11 02		0.550		0.200	0.032		0.002K		0.000	
12/02/11	13 00		0.100		0.100	0.012		0.002K		0.000	
12/02/03	12 02		0.002		1.100	0.050		0.002K		0.050	
12/04/02	11 12		0.002		0.200	0.010		0.002K		0.050	
12/07/08	11 30		0.000		1.000	0.010		0.002K		0.012K	
12/05/00	05 02		0.002		0.500	0.030		0.000K		0.010K	
12/12/18	12 30		0.120		0.200	0.010		0.002K		0.010K	
12/11/00	10 00		0.000		0.300	0.012		0.002		0.010K	

DATE	TIME	DEPTH	NO. OF	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
12/08/51	10 02		0.020		0.300	0.002		0.002K		0.010K	
12/08/19	10 00		0.000		0.300	0.000		0.002K		0.010	
12/01/01	11 10		0.012		0.200	0.002K		0.010		0.000	
12/08/09	11 02		0.550		0.200	0.032		0.002K		0.000	
12/02/11	13 00		0.100		0.100	0.012		0.002K		0.050	
12/02/03	12 02		0.002		1.100	0.050		0.002K		0.050	
12/04/02	11 12		0.002		0.200	0.010		0.002K		0.012K	
12/07/08	11 30		0.000		1.000	0.010		0.002K		0.010K	
12/05/00	05 02		0.002		0.500	0.030		0.000K		0.010K	
12/12/18	12 30		0.120		0.200	0.010		0.002K		0.010K	
12/11/00	10 00		0.000		0.300	0.012		0.002		0.010K	

0000 FEET DEPTH CLASS 00
COTTONWOOD CREEK
49 7.5 JOES VLY RES
O/JOES VALLEY RESERVOIR 110691
BANK .1 MI DOWNSTREAM FROM JOES VALLEY DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

STORET RETRIEVAL DATE 76/08/12

4908dl
39 19 20.0 111 16 36.0 4
LOWRY CREEK
49 7.5 JOES VLY RES 110691
T/JOES VALLEY RESERVOIR
HWY 29 BRDG 2.5 MI N OF JOES VALLEY DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2LN03 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/09	14 00		0.096	0.300	0.015	0.005	0.010K
74/12/18	13 30		0.136	0.500	0.010	0.005K	0.010K
75/02/08	02 45		0.045	0.200	0.032	0.008K	0.010K
75/03/08	11 30		0.080	1.050	0.016	0.008K	0.010K
75/04/05	11 15		0.065	0.550	0.010	0.005K	0.020
75/05/03	13 05		0.045	1.100	0.025	0.005K	0.020
75/05/17	13 00		0.165	0.700	0.015	0.005K	0.060
75/06/08	11 05		0.220	0.550	0.035	0.010	0.060
75/07/01	17 10		0.075	0.500	0.005K	0.005K	0.140
75/08/16	10 00		0.060	0.350	0.090	0.005K	0.010
75/09/27	10 45		0.050	0.300	0.045	0.005K	0.010K

FE22 1400 INDICATED
K ABOVE KNOWN TO BE

DATE FROM TO	TIME OF DAY	DEPTH FEET	MON	W	MON	TOT	MON
12/08/06	10 30		0.000	0.100	0.000	0.000	0.000
12/08/07	10 30		0.000	0.100	0.000	0.000	0.000
12/08/08	10 30		0.000	0.100	0.000	0.000	0.000
12/08/09	10 30		0.000	0.100	0.000	0.000	0.000
12/08/10	10 30		0.000	0.100	0.000	0.000	0.000
12/08/11	10 30		0.000	0.100	0.000	0.000	0.000
12/08/12	10 30		0.000	0.100	0.000	0.000	0.000
12/08/13	10 30		0.000	0.100	0.000	0.000	0.000
12/08/14	10 30		0.000	0.100	0.000	0.000	0.000
12/08/15	10 30		0.000	0.100	0.000	0.000	0.000
12/08/16	10 30		0.000	0.100	0.000	0.000	0.000
12/08/17	10 30		0.000	0.100	0.000	0.000	0.000
12/08/18	10 30		0.000	0.100	0.000	0.000	0.000
12/08/19	10 30		0.000	0.100	0.000	0.000	0.000
12/08/20	10 30		0.000	0.100	0.000	0.000	0.000
12/08/21	10 30		0.000	0.100	0.000	0.000	0.000
12/08/22	10 30		0.000	0.100	0.000	0.000	0.000
12/08/23	10 30		0.000	0.100	0.000	0.000	0.000
12/08/24	10 30		0.000	0.100	0.000	0.000	0.000
12/08/25	10 30		0.000	0.100	0.000	0.000	0.000
12/08/26	10 30		0.000	0.100	0.000	0.000	0.000
12/08/27	10 30		0.000	0.100	0.000	0.000	0.000
12/08/28	10 30		0.000	0.100	0.000	0.000	0.000
12/08/29	10 30		0.000	0.100	0.000	0.000	0.000
12/08/30	10 30		0.000	0.100	0.000	0.000	0.000

0000 FEET DEPTH CLASS 00
11EPALES 2111204
HWY 29 BRDG 2.5 MI N OF JOES VALLEY DAM
110691
0000 FEET DEPTH CLASS 00
11EPALES 2111204
HWY 29 BRDG 2.5 MI N OF JOES VALLEY DAM
110691

STORET RETRIEVAL DATE 76/08/12

STORET RETRIEVAL DATE 76/08/12

4908C1
39 18 15.0 111 17 25.0 4
LITTLES CREEK
49 7.5 JOES VLY RES
T/JOES VALLEY RESERVOIR 110691
MAY 29 BRDG .6 M NE OF ORG OLSEN AD SITE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2LN03 N-TOTAL	00625 TOT KJEL N	00610 NH3-N TOTAL	00671 PHOS-DIS ORTHO	00665 PHOS-TOT
			MG/L	MG/L	MG/L	MG/L P	MG/L P
74/11/09	14 20		0.088	0.400	0.020	0.005	0.010K
75/05/17	13 10		0.480	1.400	0.010	0.005	0.160
75/06/08	11 10		0.510	0.700	0.030	0.010	0.280
75/07/01	17 25		0.095	0.600	0.025	0.010	0.160
75/09/27	10 55		0.010	0.100K	0.005K	0.005K	0.010K

TEST DATA INDICATED
K VALUE UNKNOWN TO BE
LESS THAN INDICATED

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2LN03 N-TOTAL	00625 TOT KJEL N	00610 NH3-N TOTAL	00671 PHOS-DIS ORTHO	00665 PHOS-TOT
			MG/L	MG/L	MG/L	MG/L P	MG/L P
12/08/51	11 02		0.112	0.500	0.042	0.002K	0.010K
12/08/51	10 12		0.152	0.420	0.000	0.000K	0.050
12/08/51	11 30		0.850	0.712	0.012	0.050	0.120
12/08/51	11 52		0.332	0.120	0.002	0.002	
12/08/51	11 50		0.400		0.012	0.002	
12/08/51	15 02		0.130	1.112	0.048	0.002K	0.040
12/08/51	11 30		0.130	0.020K	0.010	0.002K	0.070
12/08/51	15 00		0.115	0.120	0.054	0.002K	0.010
12/08/51	13 12		0.500	1.600	0.054	0.002K	0.010
12/15/51	14 00		0.548	0.400	0.012	0.002K	0.050
12/15/51	14 40		0.554	0.300	0.040	0.002K	0.010

0000 FEET DEPTH CLASS 00
LITTLES CREEK
T/JOES VALLEY RESERVOIR 110691
MAY 29 BRDG .6 M NE OF ORG OLSEN AD SITE
11EPALES 2111204
0000 FEET DEPTH CLASS 00

STORET RETRIEVAL DATE 76/08/12

STORET RETRIEVAL DATE 75/08/12

490801
39 17 37.0 111 17 42.0 4
SEELY CREEK
49 7.5 JOES VLY RES
T/JOES VALLEY RESERVOIR 110691
SEC RD BRDG .6 MI W OF SEELY CRK BT RAMP
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH NO26NO3	00630 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/09	14 40	0.224	0.300	0.040	0.005K	0.010	
74/12/18	14 00	0.248	4.800	0.035	0.005K	0.020	
75/02/08	13 15	0.200	1.000	0.024	0.008K	0.010	
75/03/08	12 00	0.172	0.350	0.024	0.008K	0.010	
75/04/05	11 30	0.170	0.050K	0.010	0.005K	0.040	
75/05/03	12 45	0.170	1.130	0.240	0.005K	0.060	
75/05/17	13 20	0.450		0.015	0.005		
75/06/08	11 25	0.375	0.750	0.045	0.005	0.058	
75/07/01	17 30	0.220	0.175	0.015	0.020	0.020	
75/08/16	10 15	0.125	0.550	0.080	0.005K	0.020	
75/09/27	11 05	0.115	0.200	0.045	0.005K	0.010K	

FEET DATA INDICATED
K VALUE KNOWN TO BE
LESS THAN INDICATED

DATE FROM TO	TIME OF DAY	DEPTH NO26NO3	00630 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
12/00/51	10 22	0.010	0.100K	0.008K	0.000K	0.010K	
12/01/01	11 52	0.002	0.000	0.052	0.010	0.100	
12/00/08	11 10	0.010	0.100	0.030	0.010	0.500	
12/02/11	13 10	0.000	1.000	0.010	0.002	0.100	
12/11/08	14 58	0.000	0.400	0.050	0.002	0.010K	

6000 FEET DEPTH CLASS 00
11EPALES 2111204
MAX 50 BODG 0.6 MI W OF SEELY CRK BT RAMP
T/JOES VALLEY RESERVOIR 110691
SEC RD BRDG .6 MI W OF SEELY CRK BT RAMP
11EPALES 2111204
0000 FEET DEPTH CLASS 00

STORET RETRIEVAL DATE 75/08/12

STORET RETRIEVAL DATE 76/08/12

4908E1
35 15 47.0 111 17 00.0 4
SWANSEY CREEK
49 7.5 JOES VLY RES
T/JOES VALLEY RESERVOIR 110691
SEC RD BRDG 1.5 M SE OF SEELY CRK CMPGRD
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/09	14 50		0.320	0.500	0.015	0.005	0.360
75/03/08	12 10		0.196	1.150	0.024	0.032	0.280
75/04/05	11 45		0.185	2.000	0.045	0.010	
75/05/17	13 30		0.195		0.020	0.005K	0.300
75/06/08	11 40		0.015	2.700	0.035	0.015	
75/07/01	17 45		0.300	0.350	0.115	0.210	0.293
75/08/16	10 25		0.185	0.300	0.045	0.005K	0.130
75/09/27	11 10		0.110	0.250	0.005K	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED
TEST DATA INDICATED
K VALUE KNOWN TO BE

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
12/01/01	11 20		0.030	0.300	0.000	0.000	0.030
12/02/08	10 22		0.000	0.000	0.000	0.000	0.000
12/02/11	13 42		0.010	1.000	0.000	0.000	0.010
12/03/02	11 22		0.010	0.000	0.000	0.000	0.010
12/03/05	15 05		0.000	0.000	0.000	0.000	0.000
12/03/07	10 00		0.000	0.000	0.000	0.000	0.000
12/03/08	10 22		0.000	0.000	0.000	0.000	0.000
12/03/09	10 22		0.000	0.000	0.000	0.000	0.000
12/03/10	10 22		0.000	0.000	0.000	0.000	0.000
12/03/11	10 22		0.000	0.000	0.000	0.000	0.000
12/03/12	10 22		0.000	0.000	0.000	0.000	0.000
12/03/13	10 22		0.000	0.000	0.000	0.000	0.000
12/03/14	10 22		0.000	0.000	0.000	0.000	0.000
12/03/15	10 22		0.000	0.000	0.000	0.000	0.000
12/03/16	10 22		0.000	0.000	0.000	0.000	0.000
12/03/17	10 22		0.000	0.000	0.000	0.000	0.000
12/03/18	10 22		0.000	0.000	0.000	0.000	0.000
12/03/19	10 22		0.000	0.000	0.000	0.000	0.000
12/03/20	10 22		0.000	0.000	0.000	0.000	0.000
12/03/21	10 22		0.000	0.000	0.000	0.000	0.000
12/03/22	10 22		0.000	0.000	0.000	0.000	0.000
12/03/23	10 22		0.000	0.000	0.000	0.000	0.000
12/03/24	10 22		0.000	0.000	0.000	0.000	0.000
12/03/25	10 22		0.000	0.000	0.000	0.000	0.000
12/03/26	10 22		0.000	0.000	0.000	0.000	0.000
12/03/27	10 22		0.000	0.000	0.000	0.000	0.000
12/03/28	10 22		0.000	0.000	0.000	0.000	0.000
12/03/29	10 22		0.000	0.000	0.000	0.000	0.000
12/03/30	10 22		0.000	0.000	0.000	0.000	0.000
12/03/31	10 22		0.000	0.000	0.000	0.000	0.000

0000 FEET DEPTH CLASS 00
11EPALES 2111204
T/JOES VALLEY RESERVOIR 110691
SEC RD BRDG 1.5 M SE OF SEELY CRK CMPGRD
SWANSEY CREEK
49 7.5 JOES VLY RES
35 15 47.0 111 17 00.0 4

STORET RETRIEVAL DATE 76/08/12

STORET RETRIEVAL DATE 75/08/12

4908F1
39 16 35.0 111 16 45.0 4
NORTH DRAGON CREEK
49 7.5 JOES VLY RES
T/JOES VALLEY RESERVOIR 110691
BNK 2.6 MI SE OF SEELY CREEK CAMPGROUND
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N26NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
75/03/08	12 20		0.264	2.000	0.024	0.093	0.750
75/04/05	11 35		0.430	3.500	0.025	0.210	
75/05/17	13 45		0.015	1.750	0.005K	0.005	0.300
75/06/08	10 55		0.065	0.950	0.030	0.010	0.020
75/07/01	17 50		0.030	0.300	0.090		0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

FE22 DATA INDICATED
K VALUE KNOWN TO BE

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N26NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
12/08/51	11 10		0.110	0.520	0.002K	0.062K	0.050
12/08/19	10 52		0.182	0.780	0.002	0.002K	0.130
12/08/01	11 02		0.200	0.760	0.010	0.002K	0.500
12/08/08	11 09		0.012	5.100	0.002	0.012	
12/08/11	17 36		0.132		0.050	0.002K	0.300
12/08/02	11 02		0.102	5.100	0.002	0.010	
12/08/09	13 10		0.180	1.130	0.002	0.005	0.500
12/11/03	10 20		0.350	0.200	0.012	0.002	0.300

0000 FEET DEPTH CLASS 00
11EPALES
DEC 30 0800 1.2 M PE DE REEF CHK CH3950
11/08/52 AWT/EL REEF/CH 110691
08 1.2 MPE2 AFA DE2
08/08/52 REEF
12 12 0453 111 11 0000 M
CH3951

REVIEW WATERFALL DATA 11/08/52